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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/708,664 | 03/18/2004 | Min-Lung Huang | 10545-US-PA | 2663 |
| 31561 | 7590 | 11/14/2005 | EXAMINER | |
| JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE 7 FLOOR-1, NO. 100 ROOSEVELT ROAD, SECTION 2 TAIPEI, 100 TAIWAN | | | | GRAYBILL, DAVID E |
| ART UNIT | | PAPER NUMBER | | |
| | | 2822 | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

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|------------------------------|--------------------------------------|--|
| Office Action Summary | Application No. 10/708,664 | Applicant(s) HUANG ET AL.  |
| | Examiner David E. Graybill | Art Unit 2822 |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 18 August 2004.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-21 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) Claim(s) _____ is/are allowed.
6) Claim(s) 1-21 is/are rejected.
7) Claim(s) _____ is/are objected to.
8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on 18 March 2004 is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
5) Notice of Informal Patent Application (PTO-152)
6) Other: _____

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the claims 18, 19 and 21 features, "a wetting-barrier post, disposed on the barrier layer, wherein a thickness of the wetting-barrier post is larger than that of the adhesion layer," "the wetting-barrier post," and, "the thickness of the wetting barrier post is larger than the thickness of the adhesion layer and the barrier layer," respectively, must be shown or the features canceled from the claims. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet"

pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3, 4, 10 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A branching path, for which all possible variants for selecting the proper branch to be followed have been specified at the point of branching, is precise and unambiguous and we find that a claim so specified is free of indefiniteness due to "alternativeness." *Ex parte Lewin*, 154 USPQ 487 (BdPatApp&Int 1967).

The scope of claims 3, 4, 10 and 11 is indeterminable because the alternative language "if" is the point of branching of a branching path, but all possible variants for selecting the proper branch to be followed have not been specified. Specifically, the possible variant "if not" is not specified. See also MPEP 2173.05(h)III.

Claims 3, 4, 10 and 11 have not been rejected over the prior art because, in light of the 35 U.S.C. 112 rejection *supra*, there is a great deal of confusion and uncertainty as to the proper interpretation of the limitations of the claims; hence, it would not be proper to reject the claims on the basis of prior art. As stated in *In re Steele*, 305 F.2d 859, 134 USPQ 292 (CCPA

1962), a rejection should not be based on considerable speculation about the meaning of terms employed in a claim or assumptions that must be made as to the scope of the claims. Also see *In re Wilson*, 424 F.2d 1382, 165 USPQ 494 (CCPA 1970) (if no reasonably definite meaning can be ascribed to certain claim language, the claim is indefinite, not obvious). See also MPEP 2143.03 and 2173.06.

In the rejections infra, generally, reference labels are recited only for the first recitation of identical claim elements.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 5, 6, 8, 9, 12, 13 and 15-17 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Kung (20030222352).

At paragraphs 25 and 26 Kung discloses the following:

An under bump metallurgy layer, between a bonding pad 16 of a chip 10 and a bump 18, for improving adhesion between the bonding pad and the bump, comprising: an adhesion layer 212, disposed on the bonding pad; a

barrier layer 214, disposed on the adhesion layer, and a wetting-barrier layer 216, disposed on the barrier layer and between the barrier layer and the bump, wherein a material of the bump comprises tin, and wherein a material of the wetting-barrier layer is made of nickel; wherein a material of the adhesion layer is selected from the following group consisting of titanium (Ti), titanium-tungsten (Ti-W) alloy, chromium (Cr), titanium nitride (TiN), tantalum nitride (TaN), tantalum (Ta), aluminum (Al) and copper (Cu); wherein a material of the barrier layer comprises nickel-vanadium alloy; wherein the under bump metallurgy layer further comprises an inherently anti-oxidation layer 220 and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump.

A flip chip structure, comprising: a chip having an active surface, a passivation layer 14 and a plurality of bonding pads, wherein the bonding pads are disposed on the active surface and the passivation layer are disposed on the active surface exposing the bonding pads; an under bump metallurgy layer, wherein the under bump metallurgy layer comprises: an adhesion layer, disposed on the bonding pad; a barrier layer, disposed on the adhesion layer, and a wetting-barrier layer, disposed on the barrier layer, wherein a material of the wetting-barrier layer comprises nickel; and a bump, disposed on the wetting-barrier layer; wherein a material of the adhesion layer is selected from the following group consisting of titanium

(Ti), titanium-tungsten (Ti-W) alloy, chromium (Cr), titanium nitride (TiN), tantalum nitride (TaN), tantalum (Ta), aluminum (Al) and copper (Cu); wherein a material of the barrier layer comprises nickel-vanadium alloy; wherein the under bump metallurgy layer further comprises an inherently anti-oxidation layer and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump; wherein a material of the bump is made of tin-silver-copper alloy; wherein a material of the bump is made of tin-copper alloy; wherein a material of the bump comprises tin.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung as applied to claims 1 and 8, and further in combination with Petit (6399475).

Kung does not appear to explicitly disclose wherein a material of the anti-oxidation layer comprises gold.

Nonetheless, as cited, Kung discloses that the layer 220 is "some other material." Furthermore, at column 2, line 54 to column 3, line 5, Petit discloses wherein the under bump metallurgy layer further comprises an anti-oxidation layer 4 and the anti-oxidation layer is disposed between the wetting-barrier layer 3 and the bump 5; wherein a material of the anti-oxidation layer comprises gold. Moreover, it would have been obvious to combine this disclosure of Petit with the disclosure of Kung because it would prevent surface oxidation of the wetting-barrier layer of Kung.

Claims 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung (20030222352).

As cited, Kung discloses a flip chip structure, comprising a chip having an active surface, a passivation layer and a plurality of bonding pads, wherein the bonding pads are disposed on the active surface and the passivation layer are disposed on the active surface exposing the bonding

pads; an adhesion layer, disposed on the bonding pad; a barrier layer, disposed on the adhesion layer, and a wetting-barrier post 216, disposed on the barrier layer; and a bump, disposed on the wetting-barrier post; wherein a material of the wetting-barrier post is made of nickel; wherein a material of the bump is made of lead-free solder.

However, Kung does not appear to explicitly disclose wherein a thickness of the wetting-barrier post is larger than that of the adhesion layer, wherein the thickness of the wetting-barrier post is larger than the thickness of the adhesion layer and the barrier layer.

Notwithstanding, as reasoned from well established legal precedent, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that, in view of the applied prior art, the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears *prima facie* that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143

(CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Claims 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung as applied to claims 18-21 *supra*, and further in combination with Lee (20020121692).

Kung does not appear to explicitly disclose wherein a thickness of the wetting-barrier post is larger than that of the adhesion layer, wherein the thickness of the wetting-barrier post is larger than the thickness of the adhesion layer and the barrier layer.

Nevertheless, at paragraphs 13-19, Lee discloses wherein a thickness of the wetting-barrier post 20 is larger than that of the adhesion layer 18, wherein the thickness of the wetting-barrier post is larger than the thickness of the adhesion layer and the barrier layer 18. Moreover, it would have been obvious to combine this disclosure of Lee with the disclosure of Kung because it would provide a large standoff and improved thermal performance.

The art made of record and not applied to the rejection is considered pertinent to applicant's disclosure. It is cited primarily to show inventions relevant to the examination of the instant invention.

For information on the status of this application applicant should check PAIR:

Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alternatively, applicant may contact the File Information Unit at (703) 308-2733. Telephone status inquiries should not be directed to the examiner. See MPEP 1730VIC, MPEP 203.08 and MPEP 102.

Any other telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (571) 272-1930. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.
The fax phone number for group 2800 is (571) 273-8300.



David E. Graybill
Primary Examiner
Art Unit 2822

D.G.
9-Nov-05